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EXAMINER	
KLIMOWICZ, WILLIAM JOSEPH	

ART UNIT	PAPER NUMBER
2627	

DATE MAILED: 11/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	10/781,548	DING ET. AL.	
	Examiner	Art Unit	
	William J. Klimowicz	2627	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *21* is/are allowed.

6)☒ Claim(s) *1-3,5,7-18 and 20* is/are rejected.

7)☒ Claim(s) *4,6 and 19* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

Claim 4 is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 21. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 5, 9-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (US 6,127,053) in view of Werner (US 2002/0181163 A1).

As per claims 1 and 20, Lin et al. (US 6,127,053) discloses a magnetic sensor (702 - FIG. 7c), comprising a magnetoresistive sensor, said magnetoresistive sensor having an anti-parallel coupled self pinned layer (730), and having a free magnetic layer (410); and first and second compressive layers (all layers depicted in FIG. 7c, due to the lapping induced uniaxial tensile stress perpendicular to the air bearing surface (ABS) of the sensor - e.g., see COL. 8, lines 8-

12), this mechanical tensile stress explicitly affecting the magnetostriction of the self-pinned layers (734, 736)).

Additionally, as per claim 20, a data storage system (300) (FIG. 3) is provided, comprising: a motor (318) connected with a housing (structure that encases the system (300) to protect it, as is known and inherent); a spindle (314) connected with said motor (318); a magnetic disk (312) supported upon said spindle (314) for rotation about its own axis; an actuator (319); and a slider (313) supported by said actuator (319) for pivotal motion across a surface of said disk (312); a magnetic sensor (321) formed on said slider (313).

As per claim 2, wherein said anti-parallel pinned layer (PF1, APC, PF2) includes first and second ferromagnetic layers (734, 736) having a positive magnetostriction separated by anti-parallel coupling layer (735), and wherein pinning of said self pinned layer (PF1, APC, PF2) is assisted by a combination of magnetostriction (mechanically induced) and magnetostatic coupling between said first and second ferromagnetic layers (see COL. 11, lines 16-63, COL. 8, lines 10-12, etc.).

As per claim 3, wherein said self-pinned layer (PF1, APC, PF2) is pinned without the assistance of exchange coupling to an antiferromagnetic material (see FIG. 7c - no AFM layer provided, cf. with FIGS. 7a, 7b).

As per claim 5, further comprising first and second metallic layers (460, 465) formed over first and second layers of hard magnetic material (452, 454).

As per claim 12, further comprising an electrically conductive layer (415- copper) disposed between said anti-parallel pinned layer (730) and said free magnetic layer (410).

As per claim 13, wherein said first and second ferromagnetic layers (734, 736) comprise a material having a positive magnetostriction. See COL. 3, lines 52-54.

As per claim 16, wherein at least one of said ferromagnetic layers of said pinned layer comprises CoFe (see COL. 11, lines 23-25).

As per claim 18, further comprising: first and second hard magnetic bias layers (452, 454) formed above said first and second compressive layers (e.g., substrate ends under (404, 406)); and third and fourth compressive layers (e.g., 460, 465) formed above said first and second hard bias layers (452, 454) Note that since all layers have been lapped, they are compressed mechanically.

As per claim 1, however, Lin et al. (US 6,127,053) remains silent with respect to providing conventional ubiquitous shields to shield the MR sensor form extraneous magnetic fields, as is known, wherein a first magnetic shield layer is provided having a raised portion and first and second laterally opposed recessed portions extending laterally there from, such that mechanical layers (to be lapped) are formed above said first and second recessed portions of said shield.

Werner (US 2002/0181163 A1), however, discloses an analogous magnetic sensor having a magnetoresistive sensor, wherein the conventional and ubiquitous shields (S1, S2) are provided to increase the magnetoresistive head resolution, as is well known, and in addition thereto, further discloses wherein a first magnetic shield layer (e.g., S1) is provided having a raised portion (404) and first and second laterally opposed recessed portions (402) extending laterally there from, such that mechanical layers (to be lapped) are formed above said first and second recessed portions of said shield (S1).

Additionally, as per claim 15, Werner (US 2002/0181163 A1) further discloses an electrically insulating layer (G2) disposed between said shield and the layers of the MR sensor.

Given the express teachings and motivations, as espoused by Werner (US 2002/0181163 A1), it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide shield layers sandwiching the MR sensor of Lin et al. (US 6,127,053), as is ubiquitous in the art to enhance the reading resolution, and to further provide a first magnetic shield layer having a raised portion and first and second laterally opposed recessed portions extending laterally there from, such that mechanical layers (to be lapped) are formed above said first and second recessed portions of said shield, as expressly and explicitly taught and suggested by Werner (US 2002/0181163 A1).

The rationale is as follows: one of ordinary skill in the art would have been motivated to provide shield layers sandwiching the MR sensor of Lin et al. (US 6,127,053), as is ubiquitous in the art to enhance the reading resolution, and to further provide a first magnetic shield layer having a raised portion and first and second laterally opposed recessed portions extending laterally there from, such that mechanical layers (to be lapped) are formed above said first and second recessed portions of said shield, as expressly and explicitly taught and suggested by Werner (US 2002/0181163 A1) in order to provide "optimum insulation ... while maintaining planar gap layer surfaces to avoid the detrimental ramifications of reflective notching and the swing curve effect" as advocated by Werner (US 2002/0181163 A1) - see, *inter alia*, abstract of Werner (US 2002/0181163 A1).

As per claims 9, 10 and 17, although Lin et al. (US 6,127,053) in combination with Werner (US 2002/0181163 A1), fails to disclose the totality of layer thickness which has been

lapped (to induce the tensile stress), (as a thickness of at least 200 angstroms - claim 9 - or a thickness of at least 750 angstroms - claim 10 or 17 angstroms as per claim 17) given the teachings and suggestions of Lin et al. (US 6,127,053) in combination with Werner (US 2002/0181163 A1), that is providing a combined magnetic sensor with recessed and protruding shield portions and mechanically induced stressed layers that affect the positive magnetostriction of the self-pinning layers to advantageously align the magnetization axes along anti-parallel directions relative to the self-pinned films and perpendicular to the ABS, it would have been within the skill of one having ordinary skill in the art to routinely modify the combined head of Lin et al. (US 6,127,053) and Werner (US 2002/0181163 A1) in the course of routine optimization/experimentation and thereby obtain various standard optimized relationships including those set forth in claims 9, 10 and 17 (e.g., by providing the totality of the mechanically-induced stressed lapped layers to have the lapped layers exceed 750 angstroms).

That is, given the express conceptual teachings and implied/inferred suggestions of Lin et al. (US 6,127,053) in combination with Werner (US 2002/0181163 A1) as a whole, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to routinely modify the combined head of Lin et al. (US 6,127,053) and Werner (US 2002/0181163 A1) in the course of routine optimization/experimentation and thereby obtain various standard optimized relationships including those set forth in claims 9, 10 and 17 (e.g., by providing the totality of the mechanically-induced stressed lapped layers to have the lapped layers exceed 750 angstroms) in order to ensure that planarity of the overall ABS head surface, by ensuring the lapped surfaces exceed 750 angstroms in length (i.e., total thickness of all layers lapped).

Additionally, the law is replete with cases in which when the mere difference between the claimed invention and the prior art is some range, variable or other dimensional limitation within the claims, patentability cannot be found.

It furthermore has been held in such a situation, the Applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Moreover, the instant disclosure does not set forth evidence ascribing unexpected results due to the claimed dimensions. See *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984), which held that the dimensional limitations failed to point out a feature which performed and operated any differently from the prior art.

As per claims 11 and 14, although Lin et al. (US 6,127,053), in combination with Werner (US 2002/0181163 A1), does not expressly disclose the spacer layer (415) as being an insulating layer, or wherein the shield layer is in electrical communication with the shield layer, Official notice is taken that such insulating layers provided in lieu of conductor layers between free and pinned layers in a spin valve and/or shields used to conduct current, result in the conventional and ubiquitous tunnel spin valve sensors, which are notoriously old and well known and ubiquitous in the art; such Officially noticed fact being capable of instant and unquestionable demonstration as being well-known.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an insulating layer in lieu of the conducting layer (415) of Lin et al. (US

6,127,053) and/or the shield as being a conductor electrically communicating with the pinned layer, in combination with Werner (US 2002/0181163 A1), as is well known in the art.

The rationale is as follows: one of ordinary skill in the art would have been motivated to provide an insulating layer in lieu of the conducting layer (415) of Lin et al. (US 6,127,053), in combination with Werner (US 2002/0181163 A1) and/or the shield as being a conductor electrically communicating with the pinned layer, as is well known in the art in order to enhance the magnetoresistive coefficient to a range of approximately upwards of 40 percent (tunnel spin valve sensor structure), thus increasing the magnetoresistive sensitivity, as is well known, established and appreciated in the art.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (US 6,127,053) in view of Werner (US 2002/0181163 A1) as applied to claim 1 above, and further in view of Marinero (US 2004/0196597 A1).

See the discussion of Lin et al. (US 6,127,053) and Werner (US 2002/0181163 A1), *supra*.

As per claim 7, although Lin et al. (US 6,127,053) in combination with Werner (US 2002/0181163 A1) fails to disclose wherein the first and second hard magnetic layers (452, 454) comprise CoPt and further comprising first and second CrMo seed layers, such structure is known.

As an example, Marinero (US 2004/0196597 A1) discloses an analogous magnetoresistive sensor (210) having magnetic layers which comprise CoPt and further

comprising first and second CrMo seed layers (e.g., see abstract of Marinero (US 2004/0196597 A1)).

Given the express teachings and motivations, as espoused by Marinero (US 2004/0196597 A1), it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the first and second hard magnetic layers of Lin et al. (US 6,127,053), as applied in combination with Werner (US 2002/0181163 A1), as comprising CoPt and further comprising first and second CrMo seed layers as expressly taught by Marinero (US 2004/0196597 A1).

The rationale is as follows: one of ordinary skill in the art would have been motivated to provide the first and second hard magnetic layers of Lin et al. (US 6,127,053), as applied in combination with Werner (US 2002/0181163 A1), as comprising CoPt and further comprising first and second CrMo seed layers as expressly taught by Marinero (US 2004/0196597 A1)in order to "lower the resistivity of the structure while raising its magnetic coercivity." See, e.g., abstract of Marinero (US 2004/0196597 A1)

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (US 6,127,053) in view of Werner (US 2002/0181163 A1) as applied to claim 1 above, and further in view of Pinarbasi (US 6,219,207 B1).

See the discussion of Lin et al. (US 6,127,053) and Werner (US 2002/0181163 A1), *supra*.

As per claim 8, although Lin et al. (US 6,127,053) in combination with Werner (US 2002/0181163 A1) fails to disclose wherein the first and second hard magnetic layers (452, 454)

comprise CoPtCr and further comprising first and second Cr seed layers, such structure is known.

As an example, Pinarbasi (US 6,219,207 B1) discloses an analogous magnetoresistive sensor (210) having first and second hard magnetic layers (230, 230) which comprise CoPtCr and further comprising first and second Cr seed layers (232, 232).

Given the express teachings and motivations, as espoused by Pinarbasi (US 6,219,207 B1), it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the first and second hard magnetic layers of Lin et al. (US 6,127,053), as applied in combination with Werner (US 2002/0181163 A1), as comprising CoPtCr and further comprising first and second Cr seed layers as expressly taught by Pinarbasi (US 6,219,207 B1).

The rationale is as follows: one of ordinary skill in the art would have been motivated to provide the first and second hard magnetic layers of Lin et al. (US 6,127,053), as applied in combination with Werner (US 2002/0181163 A1), as comprising CoPtCr and further comprising first and second Cr seed layers as expressly taught by Pinarbasi (US 6,219,207 B1) in order to incorporate "biasing ... necessary for stabilizing the operation of the free layer." See, e.g., COL. 5, lines 58-66 of Pinarbasi (US 6,219,207 B1).

Response to Arguments

Applicant's arguments filed October 5, 2006 have been fully considered but they are not persuasive.

The Applicant alleges

> A "compressive" material is defined on page 13, lines 13-15 as, "a material which when formed with a discontinuity, such as that provided by magnetoresistive element 309, tends to want to expand into the discontinuity rather than retract from it as some other materials would do."
>
> The Examiner states that all of the layers of the sensor disclosed by Lin et al. are compressive, because of the lapping induced uniaxial tensile stress in the sensor. It is unclear to the Applicant how a "tensile" stress can cause the sensor layers to be compressive. However, even if these layers were under a compressive stress this would make them "compressed" layers rather than "compressive" layers. There is simply no teaching in any of the references that suggests using a compressive material as described in the specification in a sensor structure to increase magnetostriction induced magnetic anisotropy.
>
> Therefore, the Applicant strongly believes that none of the references teaches the use of a compressive layer as recited in claim l, and that claim 1 is therefore allowable as filed. Similarly, claim 20 which recites a sensor having a compressive layer is also allowable over the prior art. Because claim 1 is allowable, claims 2-19, which depend from allowable claim 1 are also necessarily allowable over the prior art.

As in known in civil engineering terminology, stress is the force per unit area on a body that tends to cause it to deform (such deformation being a measure of strain). It is a measure of the internal forces in a body between particles of the material of which it consists as they resist separation, compression, or sliding in response to externally applied forces. **Tensile stress** and **compressive stress** are axial forces per unit area applied to a body that tend either to extend it or compress it linearly.

As clearly noted above, Lin et al. (US 6,127,053) discloses a magnetic sensor inclusive of first and second compressive layers (all layers depicted in FIG. 7c, due to the lapping induced ***uniaxial tensile stress <u>perpendicular</u> to the air bearing surface (ABS) of the sensor*** - e.g., see COL. 8, lines 8-12), this mechanical tensile stress explicitly affecting the magnetostriction of the self-pinned layers (734, 736)).

That is, the layers in a direction of length ***perpendicular*** to the ABS increase in length in the axial direction perpendicular to the ABS. The volume of the material stays constant. Therefore in a uniaxial material the length increases in the tensile stress direction and the other two directions will decrease in size, along the plane ***hoiznontal*** to the ABS. Since the crystal structure of the material along the horzontal plane has been compacted, the repulsion force of the atoms within the crystal will create an internal expansive force due to electrostatic repulsion relative to the pre-initial stressed state, i.e., a compressive stress in the ***horizontal*** plane.

Clearly, based on the discussion *supra*, the Examiner has maintained the *prima facie* case; Lin et al. (US 6,127,053) discloses first and second compressive layers (all layers depicted in FIG. 7c compressively stressed in the horizontal plane of the ABS, due to the lapping induced ***uniaxial tensile stress perpendicular to the air bearing surface (ABS) of the sensor*** - e.g., see COL. 8, lines 8-12).

Moreover still, the Applicant has failed to produce any *evidence* that contradicts the Examiner's detailed argument based on known engineering principles (e.g., sworn affidavits which contradict the Examiner's position that Lin et al. (US 6,127,053), inherently to some degree, discloses a magnetic sensor inclusive of and first and second compressive layers, for the reasons articulated in detail, *supra*).

The Applicants mere arguments are not considered evidence.

It has been held that the mere recitation of a newly discovered function or property, inherently possessed by things in the prior art, does not cause a claim to distinguish over the prior art. Furthermore, where the Patent Office has reason to believe that a functional limitation

asserted to be critical for establishing novelty in the claimed invention may, in fact, be an inherent characteristic of the prior art, it ***possess the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on***. *In re Swinehart*, 169 USPQ 226 (CCPA 1971). See also *In re Ludtke*, 169 USPQ 563 (1971), wherein it was held that when the only alleged distinction between the applicants' claims and reference is recited functional language, it is incumbent upon the applicants', when challenged, to show that the device disclosed by the reference does not actually possess such characteristics. Additionally, as set forth in *In re Best*, 195 USPQ 430, 433 (CCPA 1977), the claiming of a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable.

Allowable Subject Matter

Claims 6 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 21 is allowed.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William J. Klimowicz whose telephone number is (571) 272-7577. The examiner can normally be reached on Monday-Thursday (6:30AM-5:00PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Thi Nguyen can be reached on (571) 272-7579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Primary Examiner
Art Unit 2627

WJK

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